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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Masahisa KOSAKA
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Title: OPTICAL MATERIALS HAVING GOOD ULTRAVIOLET ABSORBABILITY AND METHOD FOR PRODUCING THEM

DECLARATION OF MASAHISA KOSAKA

Masahisa KOSAKA, c/o Hoya Corporation, 7-5, Nakaochiai 2-chome, Shinjyuku-ku, Tokyo, Japan, declares under penalty of perjury under the laws of the United States of America, as follows:

1. I graduated from Tokai University, Faculty of Technology, Department of Industrial Chemistry, in March 1986. Since April 1986, I have been employed by Hoya Corporation, the assignee of this application, where I have been engaged in research and development of plastic lenses. I am the named inventor of this patent application and am familiar with the subject matter disclosed in this patent application.

2. I have found that optical materials having a yellowness index (YI) falling between about 0.7 and 1.8 and a 400 nm UV transmittance of at most 30 % when the thickness of the optical material is about 1.8 mm are new and have properties that are unexpected as compared with Amagai. To support this statement, I have conducted additional experiments, which I explain below.

3. In reproducing the examples of Amagai, U.S. Patent No. 6,201,061, and for the other tests described below, I used the following ultraviolet light absorbents:

SUMISOLVE 340, that is, 2-(2-hydroxy-5-tert-octylphenyl)bezotriazole;

THINUBIN 234, that is, 2-[2-hydroxy-3,5-bis(α , α -dimethylbenzyl)-phenyl]-2H-benzotriazole;

SUMISOLVE 110234, that is, 2-hydroxy-4-methoxybenzophenone; and

BIOSORB 910, that is,ethyl-2-cyano-3,3-diphenyl acrylate.

4. I conducted or had conducted under my direction additional experiments as follows:

To prove unexpected results as compared with the disclosed examples of Amagai, we conducted experiments by using same lens monomers described in Example 7 of this patent application with the ultraviolet light absorbents which were used in the examples of Amagai and 2-(2-hydroxy-4-octyloxyphenyl)-benzotriazole.

The physical properties of the plastic lenses we produced herein were measured according to the methods mentioned below.

1. Yellowness Index (YI):

This is measured according to JIS K7103-1977, which describes the yellowness index of plastics and test methods for determining the yellowness index of plastics.

2. Transmittance:

The 400 nm UV transmittance of each plastic lens was measured using a spectrophotometer, Hitachi Model U3410.

5. This section describes the additional experiments we conducted. In each of the Comparative Additional Experiments we conducted, we used a UV absorbent disclosed

Additional Experiment 1

The substance of Additional Experiment 1 is same as that of Example 7 in this patent application.

93.0 parts by weight of bis-(β-epithiopropyl)sulfide, 1.0 part by weight of 2-hydroxyethyl methacrylate, and 0.50 parts by weight of 2-(2-hydroxy-4-octyloxyphenyl)-benzotriazole serving as a UV absorbent were mixed with stirring, to which were added 6.0 parts by weight of n-butyl thioglycolate, and 0.25 parts by weight of N,N-diethanolamine serving as a catalyst, and further stirred under a reduced pressure of 10 mm Hg for 3 hours to prepare a monomer composition for lenses.

Next, the monomer composition was cast into a glass mold for lenses (lens power: 0.00D, lens diameter 80 mm, lens thickness 1.8 mm), which had been previously prepared and equipped with a resin gasket. The mold was put into an electric furnace, and gradually heated therein from

20°C. up to 100°C. over a period of 20 hours and then kept heated at 100°C. for 30 minutes, through which the monomers were polymerized.

After the polymerization, the mold was released, and the lens formed was further heated at 110°C. for 1 hour.

The center (having a thickness of 1.8 mm) of the lens thus obtained had a YI of 1.8. The lens was slightly yellowish, but its 400 nm UV transmittance was 10% and its UV-blocking capability was good. The results are shown in Table 1.

Comparative Additional Experiment 1

The substance of Comparative Additional Experiment 1 is same as that of Comparative Example 8 in this patent application.

A lens was produced in the same manner as in Additional Experiment 1, to which, however, added was 1.00 part by weight of SUMISOLVE 340, that is, 2-(2-hydroxy-5-tert-octylphenyl)-benzotriazole serving as a UV absorbent.

The center (having a thickness of 1.8 mm) of the lens thus obtained had YI of 2.3, and the 400 nm UV transmittance thereof was 7%. Though its UV-blocking capability was good, the lens was yellowish.

Comparative Additional Experiment 2

A lens was produced in the same manner as in additional experiment 1, to which, however added was 0.4 part by weight of BIOSORB 910, that is, ethyl-2-cyano-3,3-diphenyl acrylate, serving as a UV absorbent.

The center (having a thickness of 1.8 mm) of the lens thus obtained had a YI of 1.5, and the 400 nm UV transmittance thereof was 55%.

Comparative Additional Experiment 3

A lens was produced in the same manner as in Additional Experiment 1, to which, however added was 2.5 part by weight of BIOSORB 910, that is,ethyl-2-cyano-3,3-diphenyl acrylate, serving as a UV absorbent.

The center (having a thickness of 1.8 mm) of the lens thus obtained had a YI of 3.7, and the 400 nm UV transmittance thereof was 7%.

Comparative Additional Experiment 4

A lens was produced in the same manner as in Additional Experiment 1, to which, however added was 5.0 part by weight of BIOSORB 910, that is, ethyl-2-cyano-3,3-diphenyl acrylate, serving as a UV absorbent.

The center (having a thickness of 1.8 mm) of the lens thus obtained had a YI of 5.3, and the 400 nm UV transmittance thereof was 0.8%.

Comparative Additional Experiment 5

A lens was produced in the same manner as in Additional Experiment 1, to which, however added was 0.2 part by weight of THINUBIN 234, that is, (2-[2-hydroxy-3,5-bis(α , α -dimethylbenzyl)-phenyl]-2H-benzotriazole, serving as a UV absorbent.

The center (having a thickness of 1.8 mm) of the lens thus obtained had a YI of 2.0 and the 400 nm UV transmittance thereof was 13%.

Comparative Additional Experiment 6

A lens was produced in the same manner as in Additional Experiment 1, to which, however added was 0.4 part by weight of THINUBIN 234, that is, (2-[2-hydroxy-3,5-bis(α , α -dimethylbenzyl)-phenyl]-2H-benzotriazole, serving as a UV absorbent.

The center (having a thickness of 1.8 mm) of the lens thus obtained had a YI of 2.7 and the 400 nm UV transmittance thereof was 2.7%.

Comparative Additional Experiment 7

A lens was produced in the same manner as in Additional Experiment 1, to which, however added was 0.4 part by weight of SUMISOLVE 110234, that is, 2-hydroxy-4-methoxybenzophenone, serving as a UV absorbent.

The center (having a thickness of 1.8 mm) of the lens thus obtained had a YI of 2.1 and the 400 nm UV transmittance thereof was 44%.

Comparative Additional Experiment 8

A lens was produced in the same manner as in Additional Experiment 1, to which, however added was 2.5 part by weight of SUMISOLVE 110234, that is, 2-hydroxy-4-methoxybenzophenone, serving as a UV absorbent.

The center (having a thickness of 1.8 mm) of the lens thus obtained had a YI of 6.0 and the 400 nm UV transmittance thereof was 1.5%.

Comparative Additional Experiment 9

A lens was produced in the same manner as in Additional Experiment 1, to which, however added was 5.0 part by weight of SUMISOLVE 110234, that is, 2-hydroxy-4-methoxybenzophenone, serving as a UV absorbent.

The center (having a thickness of 1.8 mm) of the lens thus obtained had a YI of 9.0 and the 400 nm UV transmittance thereof was 0%.

All of results regarding the above Additional Experiment and Comparative Additional Experiments are shown in attached Table 1.

From the above data, tabulated in Table 1, I conclude that all of the present claims in this application, which require a yellowness index (YI) between about 0.7 and 1.8 and a 400 nm UV transmittance of at most 30 % when the monomer is a episulfide monomer and the thickness of the optical material is about 1.8 mm are not anticipated by Amagai, all of whose UV absorbents produce lenses having a YI of 2.1 or more, a 400 nm UV transmittance of 14% or less, or both.

I declare under the penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed at Tokyo, Japan, this 22 day of May , 2003

Masahisa Kosaka

Masahisa Kosaka

Table 1

	Starting Monomer	UV Absorbent	YI	Center Thickness (mm)	Transmittance (%) at 400 nm
Add. Ex 1	bis(β-epithiopropyl) sulfide (93.0) 2-hydroxyethyl methacrylate (1.0) n-butyl thioglycolate (6.0)	2-(2-hydroxy-4-octyloxyphenyl)-benzotriazole (0.50)	1.8	1.8	10
Comp. Add. Ex. 1	bis(β-epithiopropyl) sulfide (93.0) 2-hydroxyethyl methacrylate (1.0) n-butyl thioglycolate (6.0)	2-(2-hydroxy-5-tert-octylphenyl)-benzotriazole (1.0)	2.3	1.8	7
Comp. Add. Ex. 2	bis(β-epithiopropyl) sulfide (93.0) 2-hydroxyethyl methacrylate (1.0) n-butyl thioglycolate (6.0)	ethyl-2-cyano-3,3-diphenyl acrylate (0.4)	1.5	1.8	55
Comp. Add. Ex. 3	bis(β-epithiopropyl) sulfide (93.0) 2-hydroxyethyl methacrylate (1.0) n-butyl thioglycolate (6.0)	ethyl-2-cyano-3,3-diphenyl acrylate (2.5)	3.7	1.8	7
Comp. Add. Ex. 4	bis(β-epithiopropyl) sulfide (93.0) 2-hydroxyethyl methacrylate (1.0) n-butyl thioglycolate (6.0)	ethyl-2-cyano-3,3-diphenyl acrylate (5.0)	5.3	1.8	0.8
Comp. Add. Ex. 5	bis(β-epithiopropyl) sulfide (93.0) 2-hydroxyethyl methacrylate (1.0) n-butyl thioglycolate (6.0)	2-[2-hydroxy-3,5-bis(α , α -dimethylbenzyl)-phenyl]-2H-benzotriazole (0.2)	2.0	1.8	14
Comp. Add. Ex. 6	bis(β-epithiopropyl) sulfide (93.0) 2-hydroxyethyl methacrylate (1.0) n-butyl thioglycolate (6.0)	2-[2-hydroxy-3,5-bis(α , α -dimethylbenzyl)-phenyl]-2H-benzotriazole (0.4)	2.6	1.8	2.7

Comp. Add. Ex. 7	bis(β-epithiopropyl) sulfide (93.0) 2-hydroxyethyl methacrylate (1.0) n-butyl thioglycolate (6.0)	2-hydroxy-4-methoxybenzophenone (0.4)	2.1	1.8	44
Comp. Add. Ex. 8	bis(β-epithiopropyl) sulfide (93.0) 2-hydroxyethyl methacrylate (1.0) n-butyl thioglycolate (6.0)	2-hydroxy-4-methoxybenzophenone (2.5)	6.0	1.8	1.5
Comp. Add. Ex. 9	bis(β-epithiopropyl) sulfide (93.0) 2-hydroxyethyl methacrylate (1.0) n-butyl thioglycolate (6.0)	2-hydroxy-4-methoxybenzophenone (5.0)	9.0	1.8	0